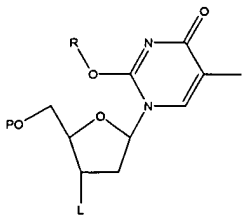
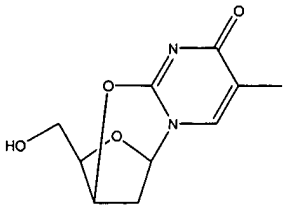
THAT WHICH IS CLAIMED:

1. A method for preparing a compound having the following formula:

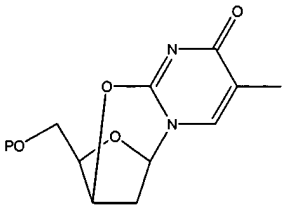


wherein R is an alkoxy blocking group; P is a hydroxyl protecting group; and L is a leaving group, the method comprising the steps of:

a. reacting a compound of the formula:

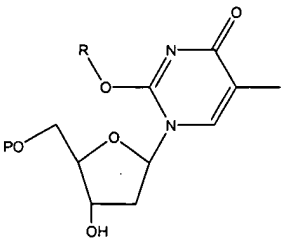


with a hydroxyl protecting group to produce a compound having the following formula:



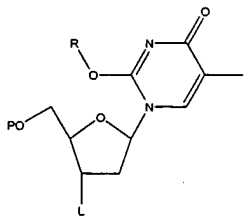
wherein P is the same as defined above;

b. enolating the reaction product of step (a) produce a compound having the following formula:



wherein P and R are the same as defined above; and

c. incorporating a leaving group to produce a compound having the following formula:



2. The method according to Claim 1, wherein P is selected from the group consisting of methoxymethyl ether, methylthiomethyl ether, 2-methoxyethoxymethyl ether, 1-ethoxyethyl ether, 1-methyl-1-methoxyethyl ether, t-butyl ether, allyl ether, benzyl ether, 4-nitrobenzyl ether, o-nitrobenzyl ether, trityl ether, monomethoxytrityl ether, dimethoxytrityl ether, tritylone ether, tetrahydropyran ether, tetrahydrothiopyranyl ether, 4-methoxy tetrahydropyran ether, 4-methoxytetrahydrothiopyranyl ether, tetrahydrofuran ether, tetrahydrotriofuranyl ether, isobutyrate ester, pivaloate ester, adamantoate ester, benzoate ester, 2,4,6,-trimethylbenzoate ester, methyl carbonate, allyl carbonate, benzyl carbonate, p-nitrobenzyl carbonate, t-Bu carbonate, *S*-benzylthio carbonate, *N*-phenyl carbamate, and nitrate ester.

3. The method according to Claim 1, wherein P is selected from the group consisting of dimethoxytrityl, monomethoxytrityl, trityl, t-butyloxycarbonyl, t-butyldimethylsilyl, t-butyldiphenylsilyl, tetrahydropyranyl ether, tetrahydrofuranyl ether, ethoxyethyl ether, and 1-methyl-1-methoxyethyl ether.

4. The method according to Claim 1, wherein R is alkyl C_1-C_4, *i*-propyl, benzyl, cycloalkane C_3-C_6, phenyl, tosyl, acetate, or benzoate.

5. The method according to Claim 1, wherein R is methyl, ethyl, *i*-propyl, benzyl, or cycloalkane C_3-C_6.

6. The method according to Claim 1, wherein step (b) includes treating the reaction product of step (a) with an alkoxide having 1 to 4 carbons, cycloalkoxide C_3-C_6, phenoxide, tosyate, acetate, or benzoate.

7. The method according to Claim 6, wherein the alkoxide is sodium methoxide.

8. The method according to Claim 1, wherein L is a sulfonate ester.

9. The method according to Claim 1, wherein L is selected from the group consisting of mesylate, nosylate, tosylate, and triflate.

10. A method for preparing a precursor for the preparation of a radiolabeled nucleoside comprising:

a. converting a 2-deoxy nucleoside into a 2,3'-anhydronucleoside;

b. reacting the 2,3'-anhydronucleoside with a hydroxyl protecting group to produce a 2,3'-anhydronucleoside derivative wherein the 5'-O group is protected;

c. reacting the protected 2,3'-anhydronucleoside derivative with a reagent that opens the 2,3'-anhydro-ring and enolates the 2-position on the pyrimidine ring; and

d. incorporating a leaving group to produce the radiolabeled nucleoside precursor.

11. The method according to Claim 10, wherein the nucleoside is thymidine, cytidine, or uridine.

12. A method for preparing a precursor for the preparation of ^{18}F-FLT comprising:

a. converting thymidine into 2,3'-anhydrothymidine;

b. reacting the 2,3'-anhydro thymidine with a hydroxyl protecting group to produce a 2,3'-anhydrothymidine derivative wherein the 5'-O group is protected;

c. reacting the protected 2,3'-anhydrothymidine derivative with a reagent that opens the 2,3'-anhydro-ring and enolates the 2-position on the pyrimidine ring; and

d. incorporating a leaving group to produce the ^{18}F-FLT precursor.

13. The method according to Claim 12, wherein step (c) produces an enol having an –O-R group attached to the 2-carbon.

14. A method according to Claim 13, wherein R is alkyl C_1-C_4, *i*-propyl, benzyl, cycloalkane C_3-C_6, phenyl, tosyl, acetate, or benzoate.

15. A method according to Claim 12, wherein step (c) includes treating the reaction product of step (b) with an alkoxide.

16. A method according to Claim 16, wherein the alkoxide is sodium methoxide, sodium ethoxide,

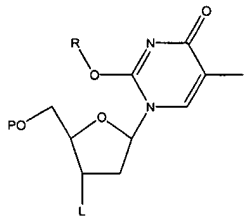
17. A method according to Claim 12, wherein the hydroxyl protecting group is dimethoxytrityl, monomethoxytrityl, trityl, t-butyloxycarbonyl, t-butyldimethylsilyl, t-butyldiphenylsilyl, tetrahydropyranyl ether, tetrahydrofuranyl ether, ethoxyethyl ether, or 1-methyl-1-methoxyethyl ether.

18. A method according to Claim 12, wherein the hydroxyl protecting group is dimethoxytrityl, monomethoxytrityl, or trityl.

19. A method according to Claim 12 wherein the leaving group is a sulfonate ester.

20. A method according to Claim 19, wherein the leaving group is mesylate, tosylate, nosylate, or triflate.

21. A compound having the following formula:



wherein R is alkyl C_1-C_4, *i*-propyl, benzyl, cycloalkane C_3-C_6, phenyl, tosyl, acetate, or benzoate; P is a hydroxyl protecting group; and L is a leaving group.

22. A compound according to Claim 21, wherein R is methyl or ethyl.

23. A compound according to Claim 21, wherein P is methoxymethyl ether, methylthiomethyl ether, 2-methoxyethoxymethyl ether, 1-ethoxyethyl ether, 1-methyl-1-

methoxyethyl ether, t-butyl ether, allyl ether, benzyl ether, 4-nitrobenzyl ether, o-nitrobenzyl ether, trityl ether, monomethoxytrityl ether, dimethoxytrityl ether, tritylone ether; tetrahydropyran ether, tetrahydrothiopyranyl ether, 4-methoxy tetrahydropyran ether, 4-methoxytetrahydrothiopyranyl ether, tetrahydrofuran ether, tetrahydrotriofuranyl ether, isobutyrate ester, pivaloate ester, adamantoate ester, benzoate ester, 2,4,6,-trimethylbenzoate ester; methyl carbonate, allyl carbonate, benzyl carbonate, p-nitrobenzyl carbonate, t-Bu carbonate, *S*-benzylthio carbonate, *N*-phenyl carbamate, or nitrate ester.

24. A compound according to Claim 21, wherein P is dimethoxytrityl, monomethoxytrityl, trityl, t-butyloxycarbonyl, t-butyldimethylsilyl, t-butyldiphenylsilyl, tetrahydropyranyl ether, tetrahydrofuranyl ether, ethoxyethyl ether, or 1-methyl-1-methoxyethyl ether.

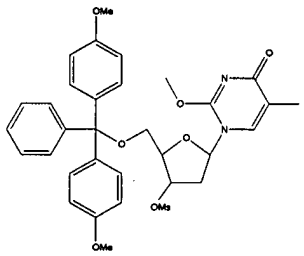
25. A compound according to Claim 21, wherein P is dimethoxytrityl.

26. A compound according to Claim 21, wherein L is a sulfonate ester.

27. A compound according to Claim 21, wherein L is selected from the group consisting of p-(2,4-dinitroanilino)benzenesulfonyl, benzenesulfonyl, methylsulfonyl (mesylate), p-methylbenzenesulfonyl (tosylate), 4-nitrobenzene sulfonyl (nosylate), p-bromobenzenesulfonyl, trifluoromethylsulfonyl (triflate), trichloroacetimidate, 2,2,2-trifluoroethanesulfonyl, imidazolesulfonyl.

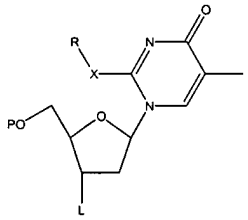
28. A compound according to Claim 21, wherein R is methyl, P is dimethoxy trityl, and L is mesylate, tosylate, or nosylate.

29. A compound having the following formula:



wherein Ms is methylsulfonyl.

30. A compound having the following formula:



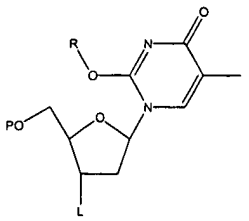
wherein R is alkyl C_1-C_4, *i*-propyl, benzyl, cycloalkane C_3-C_6, phenyl, tosyl, acetate, or benzoate; P is a hydroxyl protecting group; X is oxygen, sulfur, or nitrogen, and L is a leaving group.

31. A compound according to Claim 30, wherein L is halogen, p-(2,4-dinitroanilino)benzenesulfonyl, benzenesulfonyl, methylsulfonyl (mesylate), p-methylbenzenesulfonyl (tosylate), 4-nitrobenzene sulfonyl (nosylate), p-bromobenzenesulfonyl, trifluoromethylsulfonyl (triflate), trichloroacetimidate, acyloxy, 2,2,2-trifluoroethanesulfonyl, imidazolesulfonyl, or 2,4,6-trichlorophenyl.

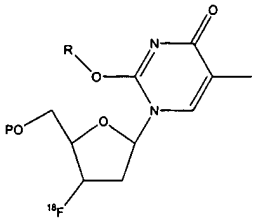
32. A compound according to Claim 30, wherein P is dimethoxytrityl, monomethoxytrityl, trityl, t-butyloxycarbonyl, t-butyldimethylsilyl, t-butyldiphenylsilyl, tetrahydropyranyl ether, tetrahydrofuranyl ether, ethoxyethyl ether, or 1-methyl-1-methoxyethyl ether.

33. A method for preparing ^{18}F-FLT comprising the steps of:

a. reacting a compound having the following formula:

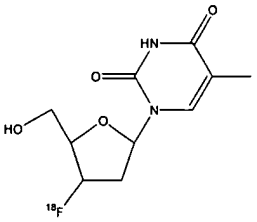


wherein R is alkyl having 1 to 4 carbons; P is a hydroxyl protecting group; and L is a leaving group, with [^{18}F] to produce a compound having the following formula:



wherein R and P are the same as defined above; and

c. removing the alkyl group and protecting group to produce a compound having the following formula:



34. A method according to Claim 33, wherein the step of removing the protecting group includes reacting the reaction product of step (b) with HCl, HBr, HOAc, H_2SO_4, HI, trimethylsilyliodide, or H_3PO_4.